Utilizing Inferred Meteorological Data Concerning Atmospheric Ceiling Boundary from Starlink to Improve Existing Atmospheric Models

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Simon Edwards
Research Acceleration Initiative

Introduction

Although the most advanced atmospheric computer models of today are both global and three-dimensional, weather forecasting leaves much to be desired. The single area of greatest potential improvement lies in rectifying the paucity of atmospheric sensors at high altitudes and over the ocean. Without an accurate, high-resolution, real-time snapshot of the atmosphere, we cannot hope to have accurate predictions of weather over periods of a month or more.

Abstract

Until such a time as (perhaps photo-magnetically-propelled) sensors can be lofted at substantially high densities to generate a more complete picture of the atmosphere, there are other areas for improvement that are more easily achievable. Today's focus will be on solving the conundrum of predicting which weather system will be dominant when converging high and low pressure systems interact. This interaction is not only critical for predicting the trajectory of hurricanes, but also introduces the preponderance of uncertainty into ensemble models. If we can eliminate much of this uncertainty at these key "decision points" in the models, we can build a more accurate model.

Meteorologists understand that what the layman calls a high or low pressure system is actually an integrated column of atmosphere that broadly rotates in two opposing directions. Many do not understand that at mesospheric altitudes, the area immediately above a low pressure system is actually an area of relative (to the neighoring areas of the same altitude) high pressure that rotates in the opposite direction as the ground-level low pressure. Ground-level high pressure systems, conversely, feature a column of counter-rotating low-pressure at mesospheric altitudes.

When low and high pressure systems are more or less evenly matched in terms of their relative strength and momentum, meteorologists look for other clues such as what surrounding weather systems are doing. This is at the essence of why global models are more accurate than continental models.

What these global models have in common is that they do not take into account a factor not often considered in fluid dynamics: The relative weight of the atmosphere in specific columns that extend to the atmospheric ceiling at between 108 and 115 miles of altitude. At points of uncertainty in a model, it is critical to be able to accurately decide how seemingly evenly-matched columns of atmosphere will interact.

I propose that by assigning an estimated weight to the atmosphere in a series of narrow columns (perhaps 5 miles in diameter each) and by estimating this

weight by mapping the contours of the atmospheric envelope using Starlink data (this can easily be inferred from the rate at which ionic propulsion is called upon to counteract drag in this satellite constellation,) it can be accurately estimated which weather systems will be dominant in those cases where both seem equally potent. In nearly all cases, I believe it will be found that the dominant system will be the one featuring a greater weight of atmosphere above, typified by a bulge of troposphere that can impose drag on satellites.

The reason for this being the case can be found not in traditional fluid dynamics, but in Newton's Laws concerning the transference of energy between systems. Anyone who has ever seen an automobile wreck knows that weight provides protection to a solid, ballistic object during a collision. Oftentimes, however, whichever object is moving faster, even when weights are identical, will better survive a collision not because of its weight, but because of its higher velocity. The product of mass and velocity determines energy and energy will always tend to flow from areas of higher concentration to those of lower concentration. For solid objects, this means that the object receiving net energy must experience the greatest G-forces. This abrupt change in direction that causes damage to an object can be traced to the injection of energy into that object, which in turn, can be traced to the asymmetry of energies.

Conclusion

When it comes to weather systems, while the momentum of pressure systems, the difference between the pressure levels of the two systems, and the activity of other bodies in neighboring areas do, indeed, remain the primary factors to consider if one wishes to accurately predict the future motion of these bodies, in the absence of complete knowledge of the state of the atmosphere, the relative height of the atmospheric envelope stands out as a heretofore overlooked variable we can easily measure that has the potential, in my judgment, to eliminate a great deal of uncertainty from the existing global forecast models.